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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,581	07/22/2004	Jeng-Huey Hwang	NAUP0568USA	4580

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NORTH AMERICA INTELLECTUAL PROPERTY CORPORATION
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EXAMINER

NGUYEN, TUAN H

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 11/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/710,581

Applicant(s)

HWANG ET AL.

Examiner

Tuan H. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 18-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Applicant's election of Species I, claims 1-17 in the reply filed on 6/3/05 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Specification

The disclosure is objected to because of the following informalities: In paragraphs [0006]-[0007], should "insert gas" be changed to -- inert gas -- ?

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Background of the invention in view of Chen et al.'511.

Background of the invention, figs. 1-2 and related text in paragraphs [0003]-[0007] discloses substantially the claimed method for patterning an HfO₂-containing gate dielectric including providing a wafer 10 having a trench, a STI layer 18 of SiO₂ formed in the trench, the HfO₂-containing gate dielectric 12 covering the wafer 10 and

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the STI layer 18, a gate electrode 16 formed on the HfO₂-containing gate dielectric 12, and at least a SiO₂ spacer 14 formed beside the gate electrode.

Background of the invention fails to teach the steps of preheating the wafer; and providing an HBr bromine-rich gas plasma to remove portions of the HfO₂-containing gate dielectric.

Chen et al., in a related method for etching an HfO₂ gate dielectric material as shown in figs. 1-10 and related text, teaches step of preheating the wafer (paragraph [0040]) for a subsequence of selective HfO₂-to-SiO₂ etching (paragraph [0047]-[0048]).

With respect to claims 3, 6, 13, 17, paragraph [0053], [0055] disclose the use of non-reactive gas plasma for preheating the wafer to a temperature of higher than 200 degrees C.

With respect to claims 9, 10 see paragraph [0020], line 5 for the gate-stacked material including TaN and doped-poly as sacrificial layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have preheated the wafer and subsequently etched the HfO₂ gate dielectric layer with bromine-rich gas plasma as suggested by Chen et al. in the conventional method for etching the HfO₂ gate dielectric as disclosed in the Background of the invention since it would provide a high etch selectivity between HfO₂-to-SiO₂ etching (paragraph [0048], line 2), prevent the damage to silicon substrate and SiO₂ layer in the STI.

With respect to claims 2, 5, 13, 16, it would have been also obvious to those skilled in the art to recognized that the bromine -rich gas plasma is inherently higher

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than 30% since it is the main etching gas in the process of etching HfO_2 , and the use of lamp tray heater is well-known as an alternative heating source in the etching apparatus, it would have been obvious to those skilled in the art to use either heating gas or lamp as a heating source in the etching apparatus, since the substitution of art recognized equivalence is within the level of those skilled in the art.


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Chen'353, Rotondaro et al., and Lin et al. disclose the process for etching high-k material.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan H. Nguyen whose telephone number is 571-272-1694. The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Tuan H. Nguyen
Primary Examiner
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